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ON THE RELATIVE DEPTHS OF LUNAR ANNULAR MOUNTAINS AND CRATERS IN THE "MARE NUBIUM" *

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SUMMARY

By comparing the photographic data of Ranger VII, the author establishes the fact that the Baldwin formula for the diameter to depth of lunar craters and annular mountains, with D ranging from 200 to 2.0 km, represents sufficiently closely the ratio for D ranging from 8 meters to 67 km. Deflections from formula (1) are observed only in large cirques or in craters having been flooded, at a much later stage, by effusion of lava from within.

* * *

The work by Baldwin [1] was devoted to the determination of the relationship between the diameter D and the depths d of lunar craters and annular mountains for values of D ranging from 200 to 2.0 km.

Comparing this dependence with those for four terrestrial meteoritic craters and for explosion excavations and funnels due to aerial bombs and artillery missiles, Baldwin wrote the square equation for the dependence

$$\log D = f(\log d),$$

having described sufficiently well the results of measurements:

$$\log D = 0.1083\ (\log d)^2 + 0.0035 \log d + 0.6200 \qquad (1)$$

where the values of D and d are expressed in meters.

It was found to be possible to study the tiny craters of diameter D up to 8 m and depth d to 2 m on the very detailed charts of Mare Nubium near the landing point of Ranger VII, drawn by photographs of the Moon from Ranger VII [2], that is, to dimensions of funnels from aerial bombs on earth.

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*[OB OTNOSITEL'NYKH GLUBINAKH LUNNYKH KOL'TSEVYKH GOR I KRATEROV V "MORE OBLAKOV"]

Inasmuch as both, the structure of upper layers of lunar and terrestrial crusts, and the formation conditions of funnels from aerial bombs on earth and of lunar crater hollows (to the tiniest ones)could be distinct, it is important to check the validity of formula (1) for tinier lunar craters on the basis of the new data, made available by the Ranger VII charts, by plotting the graph for the dependence $\log D = f\{\log d\}$.

With this in view, we compared the values of $\log D$ and $\log d$ in Table 1 and Fig. 1 for craters according to the charts [2].

TABLE 1

CHART	Знак	SCALE	CRATER diameters D, m	Number
RZC1	а	1 : 1 000 000	3400 - 67 200	35
RZC2	б	1 : 500 000	3300 - 17 500	16
RZC3	в	1 : 100 000	350 - 1 850	64
RZC4	г	1 : 10 000	43 - 360	23
RZC5	д	1 : 1 000	8.0 - 28	8

TABLE 2

lg d	lg D по (1) *	lg D по (2) **	lg D по промерам ***	Дисперсия по lg D ****
0,0000	0,6200	0,6200	0,6500	—
2,0000	2,6602	2,7592	2,7600	±0,2000
3,0000	4,0152	3,8186	3,9700	±0,2500
4,0000	5,5668	4,9728	5,5600	—

* according to (1) **** Dispersion
** (2) by log D
*** measurements

It was found that within the limits of the values of $\log D$ from 0.9294 to 4.1700 (or within the limits of D from 8.5 m to 148 km) the dependence of $\log D$ and $\log d$ was obtained nearly linear. At the same time it was revealed that the large cirque-type plains, of the Guerike, Fra Mauro and Parry types, drop from the dependence represented by formula (1), apparently because of a latest lava flooding of the bottom of these cirques. Moreover, as is shown in Fig. 1, the tinier craters (Parry A, Guerike B, La Landsberg and others) deflect also from the graph of the dependence.

The nearly linear dependence of $\log D$ and $\log d$ is also represented within the limits of D from 40 km to 8.5 m, by the equation of the line

$$\log D = 1.0662 \log d + 0.6200 \qquad (2)$$

For a more descriptive comparison with the results of computation by formulas (1) and (2) we plotted on the graph the results of measurements of lunar craters. For the values of $\log d$ the comparison of the results of calculation by formulas (1) and (2) with measurements is given in Table 2.

From the comparison of the data, brought out in Tables 1 and 2 and in Fig. 1 we reached the conclusion that owing to the ppssibility of utilizing in the present work of Ranger photographs, it is established that the Baldwin formula (1) represents sufficiently closely the dependence between the diameter and crater depth for lunar craters with diameters from 8 m to 67 km. The deflections from formula (1) are observed in very large cirques and in those craters, where the bottom may possibly have been flooded after their formation by lava effused from within.

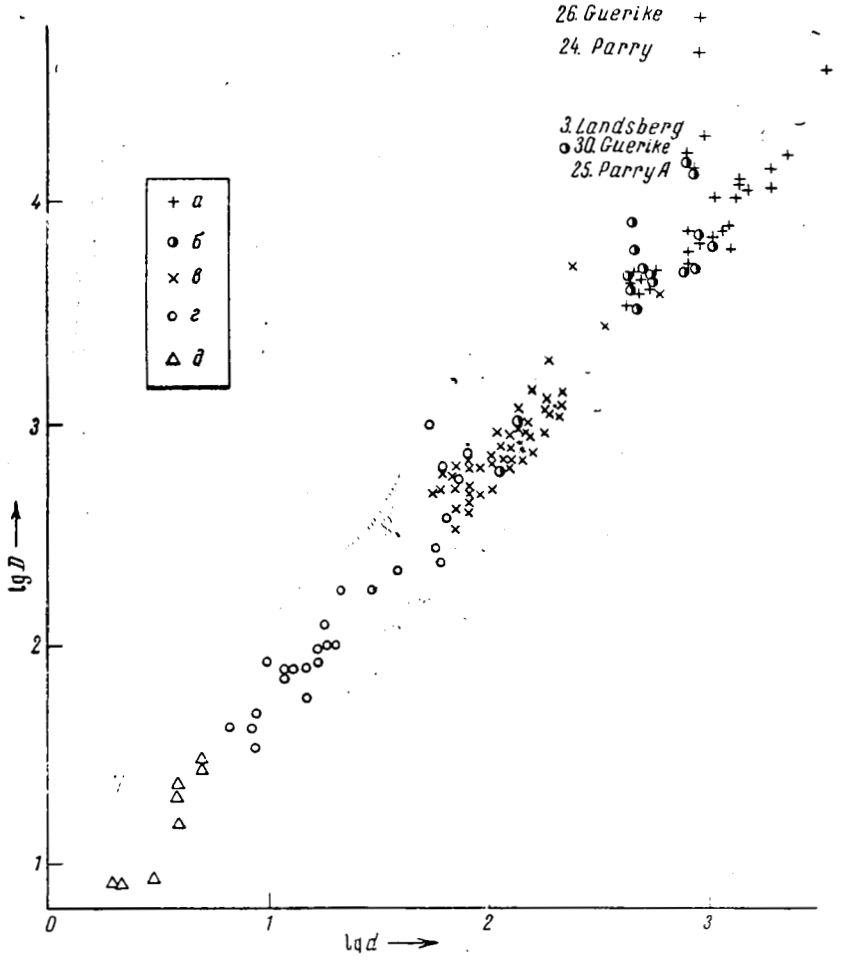

Fig. 1

THE END

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